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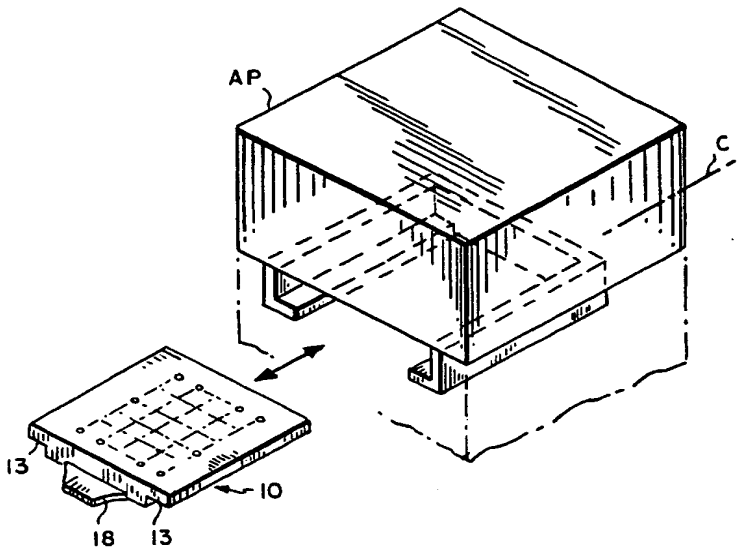
(54) Title: DISPOSABLE TIP MAGAZINE



(57) Abstract

A pipette tip magazine for use in an automated pipetting system. The automated system has a pipetting chamber with a generally U-shaped ledge and a pipette tip magazine adapted for insertion into and removal from an operative position in the chamber supported on the ledge. The magazine includes a generally rectangular plate having an edge surrounding an inner region. The edge is configured to be supported on the ledge. The inner region has an array of through openings for vertically receiving and retaining pipette tips. The plate is molded from a polymeric resin and has an inherent stiffness such that when it is supported on the ledge, a downward force of up to about 1000 Newtons applied to the inner region will produce a downward deflection of the plate at the geometric center of not more than 0.51 mms.

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DISPOSABLE TIP MAGAZINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to automated pipetting systems, and is concerned in particular with the provision of a low-cost disposable magazine for loading pipette tips into such systems.

2. Description of the Prior Art

This invention is especially adapted for, although not limited to, use with the PLATEMATE™ pipetting systems marketed by Matrix Technologies Corp. of Hudson, New Hampshire, U.S.A. Such systems employ rigid metal magazines such as aluminum, for the pipette tips. The steel magazines are expensive components and are thus continually reused in successive pipetting cycles. Magazine reuse inevitably requires laboratory personnel to frequently empty and refill them with fresh pipettes. This has been found to be a time consuming, inefficient and cumbersome procedure, but one that was deemed necessary because of the belief that only steel magazines could provide the rigidity required to resist deflection during the pipetting process.

During the pipetting process, in order to ensure a uniform seal across all of the pipette tips in the magazine, substantial force must be exerted on the magazine. If the magazine is not rigid enough, there will be some deflection across the face of the magazine.

It is important that the magazine be as flat as possible. If there is too much deflection, all of the faces of the pipette tips will not adequately seal, causing an air leak and thus uneven pipetting. The automated pipettor may be used to dispense samples into 96, 384 or 1536 well plates. It is extremely important that the pipettes be perpendicular to the magazine. If there is too much deflection and the pipette tips are slightly angled, the sample will be pipetted into an incorrect well or on a wall causing cross contamination. Precision is especially required when using the 384 or the 1536 well

plates.

The objective of the present invention is to provide an improved low-cost pipette magazine which may be discarded after a single use, thus accordingly, alleviating the drawbacks associated with the prior art reusable magazines.

SUMMARY OF THE INVENTION

The present invention stems from the discovery that a pipette magazine of adequate rigidity and stiffness can be molded from a polymeric material, with the attendant reduction in costs being such that the magazine can be economically discarded after a single use.

BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the present invention will become more apparent as the description proceeds with reference to the accompanying drawings, wherein:

Fig. 1 is a top plan view of a pipette tip magazine in accordance with the present invention;

Fig. 2 is a bottom plan view of the pipette tip magazine;

Fig. 3 is a front view of the pipette tip magazine;

Fig. 4 is a left side view of the pipette magazine;

Fig. 5 is a sectional view taken along line 5-5 in Fig. 1; and

Fig. 6 is a schematic illustration of a pipetting system and its arronated pipette tip magazine.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

A preferred embodiment of a pipette tip magazine in accordance with the present invention is generally depicted at 10 in the accompanying drawings. As shown somewhat schematically in Figure 6, the magazine 10 is adapted for insertion into the pipetting chamber "C" of an automated pipettor. The chamber has a generally U-shaped ledge configured to support the magazine in an operative pipetting position, as well understood

by those skilled in the art. The magazine 10 has a generally rectangular configuration having a front edge 12a, side edges 12b, 12c and a rear edge 12d surrounding an inner region 14. The edges 12b, 12c and 12d are undercut as at 13 to be supported on the ledge of the chamber. The inner region 14 has an array of through openings 16 for vertically receiving and retaining pipette tips. A handle 18 protrudes from the front edge 12a to facilitate manual placement and removal of the magazine in the pipetting chamber C.

It has been found that the magazine 10 can be molded from a polymeric resin with sufficient inherent stiffness such that when the magazine is supported in its operative position on edge 11, a downward force of up to approximately 1000 Newtons exerted on the inner region 14 will cause less than .51 mm of deflection, but preferably less than .38 mm of deflection at the point of force application, assuming the magazine was substantially flat when molded. Preferably, the polymeric resin will comprise a polycarbonate, which may include a filler such as glass fiber. The percentage of glass fiber to the polymeric material is preferably in a range of approximately 20 to 40 weight percent. Because the magazine is molded from a filled polymeric resin, it is relatively inexpensive, and thus may be discarded after a single use. Thus, the magazine may be supplied already filled with pipette tips and disposed after usage, thus obviating any need to resort to cumbersome time consuming reloading.

Preferably, the inner region 14 of the magazine comprises approximately 85% of the total surface area, with the remaining 15% comprising the edge region overlying the undercut 13 adapted to be seated on the ledge 11.

Typical dimensions for a suitable magazine are:

Total surface area:	98.5 cm^2
Width of undercut 13:	.51 cm
Area supported on ledge 11:	14.3 cm^2
Maximum thickness:	.90 cm

Bosses 22 may be included on the underside of the magazine to assist in the stacking of loaded magazines for packaging, such that they are easily displaced one from the other.

The foregoing description has been limited to a specific embodiment of the invention.

It will be apparent, however, that variations and modifications can be made to the invention, with the attainment of some or all of the advantages. Therefore, it is the object of the claims to cover all such variations and modifications as come within the true spirit and scope of the invention.

What is now claimed is:

CLAIMS

1. For use in an automated pipetting system having a pipetting chamber with a generally U-shaped ledge, a pipette tip magazine adapted for insertion into and removal from an operative position in said chamber supported on said ledge, said magazine comprising a generally rectangular plate having an edge surrounding an inner region, said edge being configured to be supported on said ledge, and said inner region having an array of through openings for vertically receiving and retaining pipette tips, said plate being molded from a polymeric resin and having an inherent stiffness such that when supported on said ledge, a downward force of up to about 1000 Newtons applied to said inner region will produce a downward deflection of said plate at said geometric center of not more than 0.51 mms.

2. The pipette tip magazine of claim 1, wherein the polymeric resin is polycarbonate.

3. The pipette tip magazine of claim 1, wherein the polycarbonate is filled with glass fiber.

4. The pipette tip magazine of claim 1, wherein the amount of glass fiber is approximately 20 to 40% by weight of the polycarbonate.

5. The pipette tip magazine of claim 1 wherein the edge is between 10 to 15% of the total area of the plate.

6. The pipette tip magazine of claim 1 wherein said magazines when filled with pipette tips are stackable.

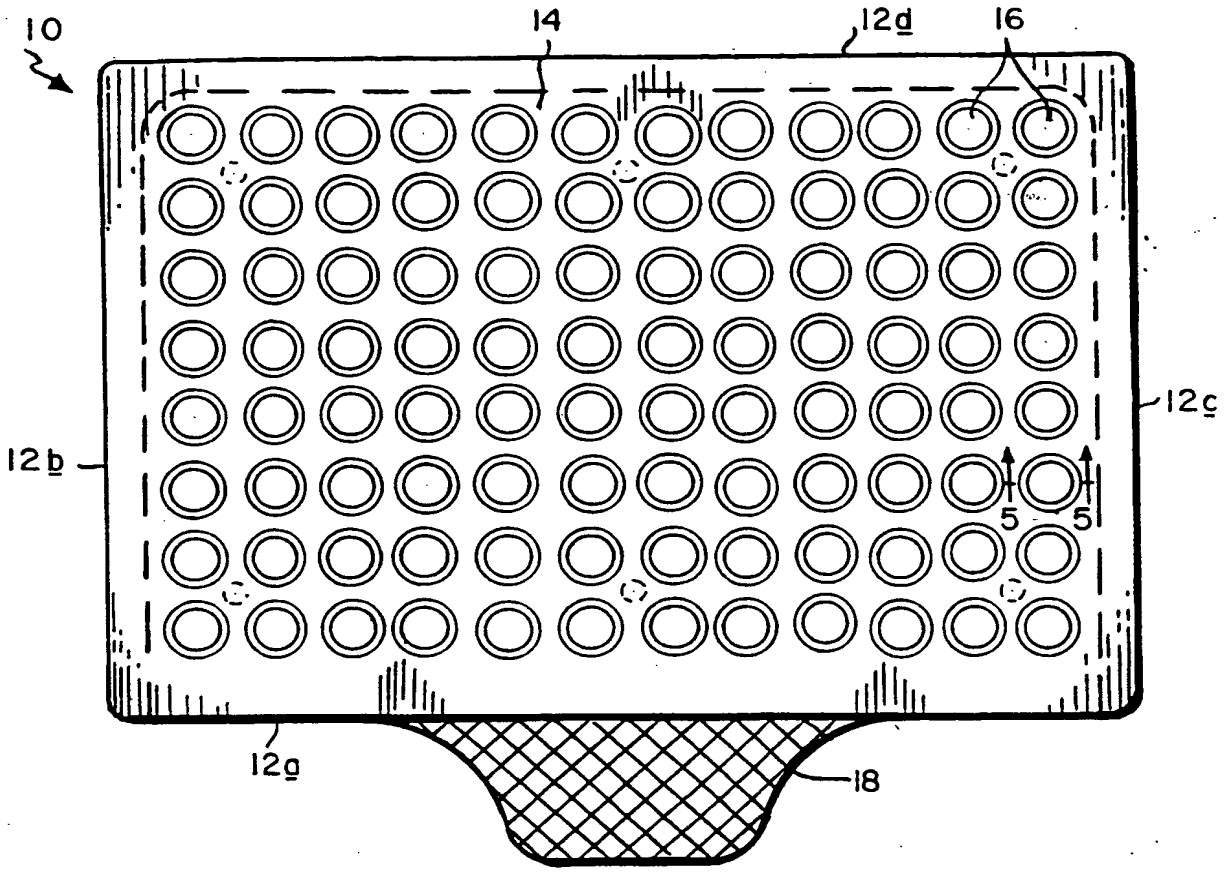

FIG. 1

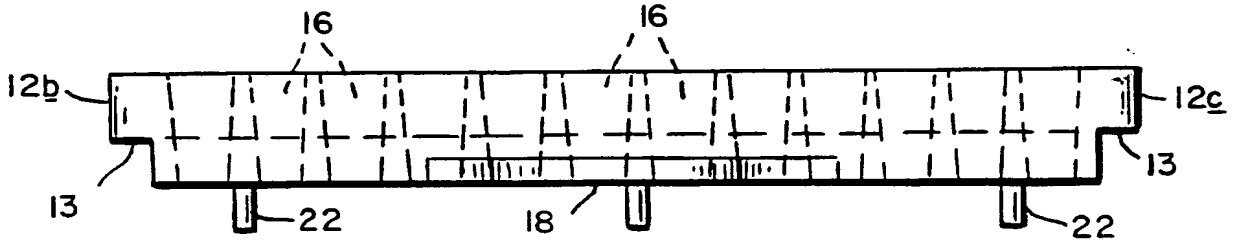

FIG. 3

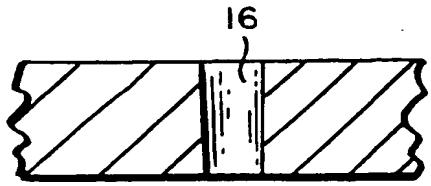

FIG. 5

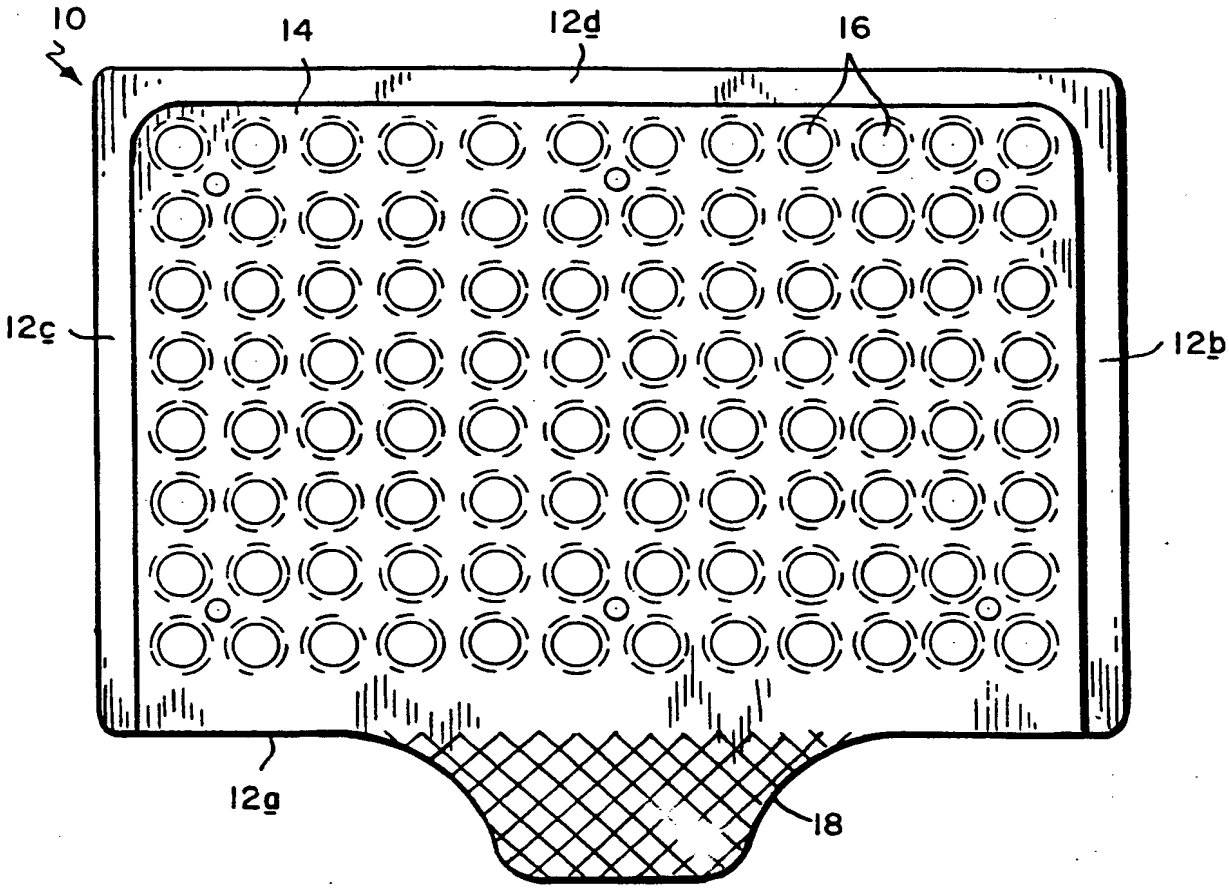

FIG. 2

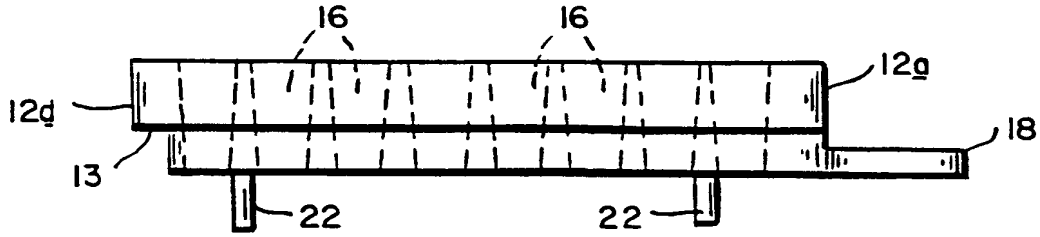

FIG. 4

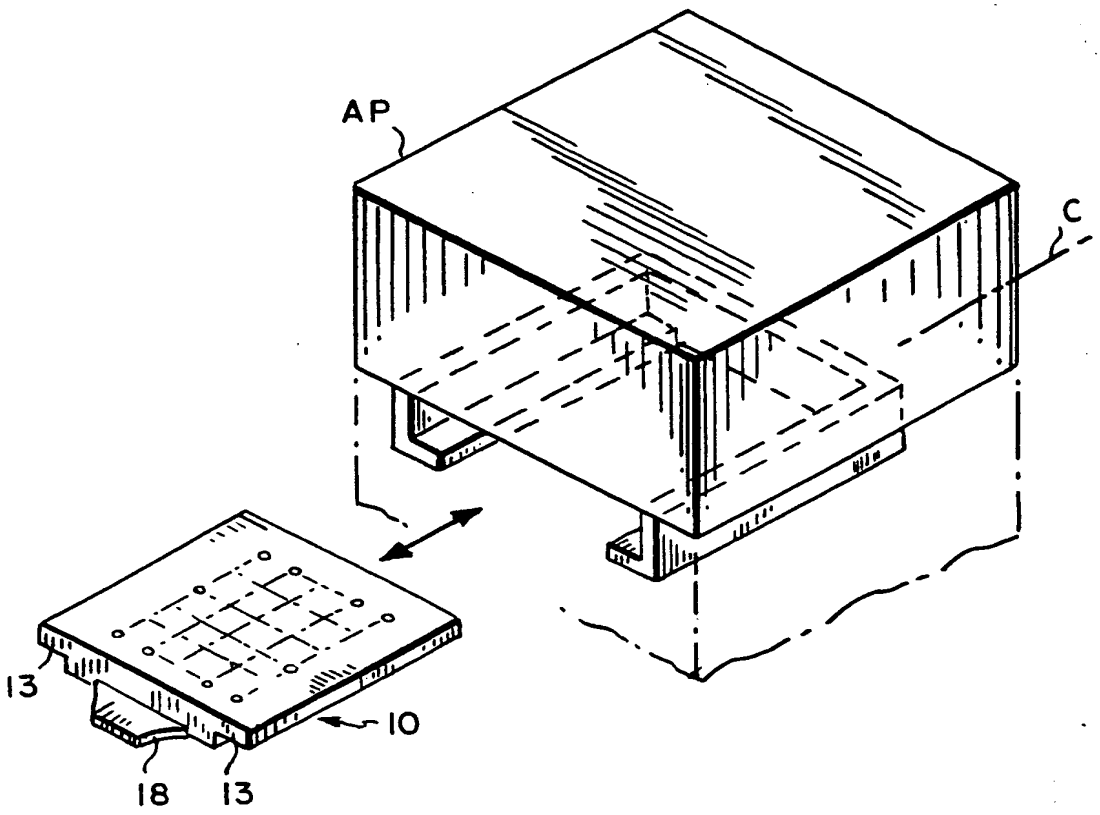

FIG. 6

INTERNATIONAL SEARCH REPORT

Internat I Application No
PCT/US 00/02379

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B01L3/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 349 109 A (SCORDATO EMIL A ET AL) 14 September 1982 (1982-09-14) column 3, line 26 - line 55	1,2,6
A	US 5 366 088 A (HILL BOB ET AL) 22 November 1994 (1994-11-22) column 5, line 13 - line 15	1,2,6
A	US 5 232 669 A (PARDINAS GUILLERMO P) 3 August 1993 (1993-08-03) column 3, line 66 -column 4, line 6; figure 2	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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22 June 2000	29/06/2000

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Information on patent family members

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